

Analysis of Pilotage Service Time Trends at Terminals in the Surabaya's West Shipping Channel

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ABSTRACT

This study analyzes the trend of Waiting Time for Pilot (WTP) and Approach Time (AT) as the main indicators of pilotage service performance at terminals in the Surabaya's West Shipping Channel (APBS). The data used comes from the monthly monitoring report of PT Pelindo Regional 3 in 2023, which includes Gresik Terminal, Jamrud Terminal, Nilam Mirah Terminal, Teluk Lamong Tanjung Perak Terminal, and Kalimas Terminal. The research method uses a descriptive-quantitative approach with a comparative analysis of actual achievements against the Corporate Work Plan and Budget (RKAP) targets. The results show that all terminals, except Teluk Lamong Terminal, managed to maintain an average WTP well below the RKAP standard of 0.50 hours, with the best performance shown by Gresik Terminal (0.04 hours). In terms of AT, Jamrud and Nilam Mirah Terminals recorded better achievements than the RKAP, Teluk Lamong Terminal was relatively on target, while Gresik Terminal showed a negative deviation with AT exceeding the RKAP target. The anomalous WTP spike at Teluk Lamong Terminal in August (5 hours) is an important note that needs to be anticipated in operational planning. This study concludes that pilotage efficiency at APBS is very good in terms of WTP, but there is still room for improvement in the AT aspect. The use of digital technologies such as Vessel Traffic Service (VTS) and E-Pilotage is recommended as a strategy to improve the consistency of pilotage performance in the future.

Keywords: waiting time for pilot, approach time, Surabaya's West shipping channel.

INTRODUCTION

Navigation safety and efficiency are fundamental aspects of modern maritime operations. As maritime traffic intensity and water conditions increase, the need for ship pilotage services becomes increasingly crucial. Ship pilotage not only serves as a technical instrument to assist captains in navigating congested waterways, but also serves as a crucial pillar in ensuring shipping safety and the sustainability of port activities [1]. Globally, the issue of maritime transportation efficiency is also a concern in supporting the smooth operation of the global logistics chain [2].

In Indonesia, particularly in the Surabaya's West Shipping Channel (APBS), pilotage services have developed with three main approaches, namely physical methods, Vessel Traffic Service (VTS), and a new concept currently being initiated, namely E-Pilotage [3], [4]. The physical pilotage method is still the most conventional practice, where a pilot goes directly onto the ship to provide navigation instructions to the captain. This method has the advantage that the pilot can directly observe the water conditions, although it is not free from limitations such as the risk of delays due to extreme weather or limited pilot transportation facilities [5].

Meanwhile, VTS is a land-based system that relies on radar technology, AIS (Automatic Identification System), and radio communications to monitor and control ship movements within a specific area. VTS has been proven to increase the efficiency of maritime traffic flow, but its nature is more of a surveillance and general information provider [6], [7]. The human factor remains a crucial element in the effectiveness of VTS, so operator quality greatly influences shipping safety [8].

On the other hand, E-Pilotage is an innovative idea that combines digital technology, long-distance communication, and real-time data analysis to provide navigation guidance without the physical

presence of a pilot on board [9], [10]. The implementation of VTS and E-Pilotage in several Indonesian waters has also shown a contribution to improving the smooth flow of ships, although its effectiveness still varies [11].

These three methods have their own challenges, both in terms of cost, regulation, and operational reliability. However, the aspect that is often the main concern for port service users is the pilotage service time, especially Waiting Time for Pilot (WTP). WTP represents the length of time a ship waits before receiving pilotage services, which ultimately greatly affects the efficiency of the port logistics chain. Delays in pilotage mean increased ship operational costs, delayed loading and unloading, and the potential for wider economic losses. Thus, WTP can be seen as a key performance indicator (KPI) in ship pilotage services [12], [13].

This condition is very relevant in Tanjung Perak Port, Surabaya, which is a strategic port with mandatory pilotage status based on national regulations, and serves large vessels including cruise ships with a length of up to 330 meters. The high traffic flow in APBS makes pilotage services a vital aspect in maintaining the smooth flow of national and international goods [14]. In practice, various factors such as weather conditions, availability of pilotage motors, and limited human resources often affect the length of the WTP [15].

PT Pelindo has implemented various innovations to minimize WTP. For example, the use of Rigid Inflatable Boat (RIB) type pilot motors that are more reliable in bad weather conditions, as well as the procurement of tablet-based Portable Pilot Units (PPU) with integrated navigation software. Another effort is the implementation of a real-time monitoring system through an online application integrated into the Port Operation Command Center (POCC). However, despite various initiatives that have been carried out, the WTP phenomenon remains an issue that requires in-depth analysis, especially in the context of comparisons between terminals in the APBS [16].

In general, previous studies have emphasized that a combination of human expertise and technology provides the best results in improving safety and reducing the risk of maritime accidents. However, at the operational level, the issue of service time, particularly WTP, often receives less attention [1], [2]. In fact, waiting time is one of the factors directly felt by service users and is a primary measure of port service efficiency.

RESEARCH METHODS

Types and approaches of research

This study uses a quantitative descriptive approach with qualitative support. The quantitative approach is used to analyze numerical data related to Waiting Time for Pilot (WTP) at each terminal in the Surabaya's West Shipping Channel (APBS). The analysis is carried out by calculating the average WTP, identifying variations between terminals, and comparing the consolidated results of all terminals. The qualitative approach supports data interpretation through in-depth interviews with stakeholders, such as pilots, Vessel Traffic Service (VTS) operators, and PT Pelindo (Persero) management. With this combination, the study is able to provide a comprehensive picture, not only in terms of numbers, but also factors that influence the occurrence of WTP variations [17].

Research Location

The research location is the West Surabaya Shipping Lane (APBS), one of the busiest shipping lanes in Indonesia. APBS serves both domestic and international vessels, with five main terminals being the focus of the study:

1. Gresik Terminal
2. Jamrud Terminal
3. Kalimas Terminal
4. Nilam Mirah Terminal
5. Tanjung Perak Terminal

These five terminals were selected because they have a high volume of ship visits and different operational characteristics, making them representative for studying variations in WTP trends in the APBS area.

Data and Data Sources

The types of data used in this study are secondary and primary data.

1. Secondary data was obtained from PT Pelindo Regional 3's 2023 pilotage operational report, which contains information on the average WTP per terminal. This data includes the number of vessel visits, pilotage schedules, and a summary of waiting times at each terminal.
2. Primary data was obtained through interviews with ship pilots, VTS operators, and port management. Interviews were used to explore factors contributing to variations in WTP, such as weather constraints, limited pilotage motors, or technical factors such as communication delays.

Research Variables

The main variable of this study is Waiting Time for Pilot (WTP), which is defined as the length of time the ship waits from arriving at the Pilot Boarding Ground (PBG) until the pilot boards the ship and starts pilotage services.

The indicators analyzed include:

1. Average WTP per terminal – describes the pilotage efficiency at a particular terminal.
2. Comparison between terminals – identifying the best and worst performing terminals.
3. APBS Recapitulation – shows the consolidated performance of all terminals as one system.

Data collection technique

Data collection techniques are carried out in several ways:

1. Documentation: Collecting official PT Pelindo report data regarding pilot waiting times per terminal throughout 2023.
2. Field observation: Directly observing the pilotage process at several terminals to understand operational dynamics, especially during extreme weather conditions.
3. Semi-structured interviews: Conducted with ship pilots, VTS operators, and port officials. Questions focused on technical and non-technical constraints that contributed to the occurrence of WTP.

Data Analysis Techniques

The data was analyzed using the following stages:

1. Descriptive Statistical Analysis
 - Calculate the average WTP per terminal.
 - Comparing WTP values between terminals.
 - Create a consolidated recapitulation of WTP for all APBS.
2. Trend Analysis
 - Identifying WTP patterns throughout 2023.
 - Analyze the differences in trends between terminals to see variations in the efficiency of pilotage services.
3. Qualitative Analysis
 - Interpreting numerical data based on interviews.
 - Identify the main causes of variations in WTP, such as bad weather, limited pilot motor facilities, or operational coordination problems.
4. Data Triangulation
 - Combining the results of statistical analysis with the results of interviews and observations.
 - Provide validation of research findings to obtain a comprehensive picture of WTP in APBS.

Reasons for Selecting WTP as the Focus

WTP was chosen as the primary research variable because it has direct implications for logistics costs and user satisfaction. Long waiting times can increase ship operational costs, such as fuel consumption at anchor and demurrage. Furthermore, WTP is the most readily perceived measure of pilotage performance by ship owners and logistics operators. Therefore, analyzing WTP trends across all APBS terminals will provide a clear picture of the efficiency of pilotage services in the region.

Research Limitations

This study only covers WTP data for 2023 and is limited to five terminals in the APBS. Furthermore, the implementation of E-Pilotage, which is still a projection, cannot be evaluated practically. This study also does not provide an in-depth comparison of operational costs or accident risk analysis, instead focusing on waiting time indicators. However, these limitations do not diminish the research's relevance, as the WTP trend itself reflects a key aspect of port operational efficiency.

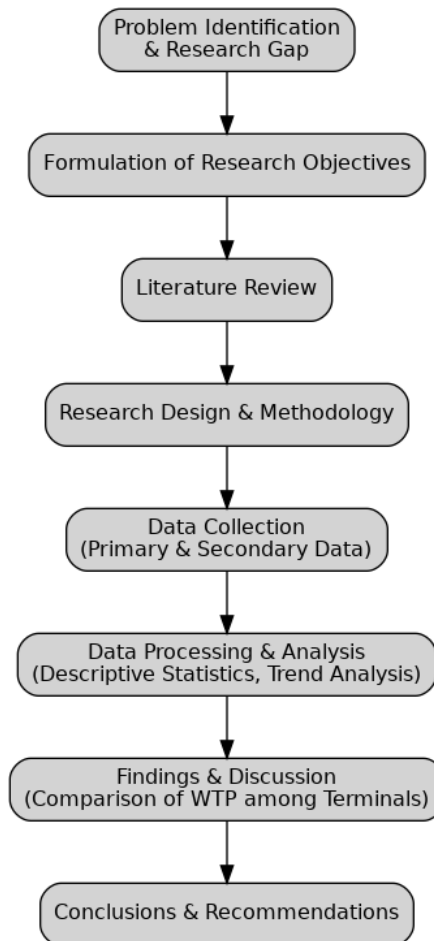


Figure 1. Flow chart

RESULTS AND DISCUSSION

Waiting Time for Pilot (WTP) and Approach Time (AT) are the main indicators used to evaluate the performance of pilotage services in the Surabaya's West Shipping Channel(APBS). WTP represents the length of time a vessel waits for a pilotage from the time it is declared ready to be piloted until the service begins, while AT indicates the duration from the pilot boarding the vessel until the vessel reaches the dock. These two indicators reflect the effectiveness of coordination between pilotage, port authorities, and the readiness of supporting facilities. The data used in this study comes from the 2023 Regional 3 Monthly Monitoring Document of PT Pelindo, which covers five main terminals in APBS: Gresik Terminal, Jamrud Terminal, Kalimas Terminal, Nilam Mirah Terminal, and Teluk Lamong Terminal (TTL) Tanjung Perak Terminal.

Gresik Terminal

Table 1 shows the consolidated results of WTP and AT at the Gresik Terminal throughout 2023.

Table 1. Average WTP and AT of Gresik Terminal in 2023

Indicator	Unit	Work Plan and Budget	Average	Information
WTP	Hours	0.50	0.04	Very efficient
AT	Hours	2.23	3.44	Exceeding the target

Source: PT Pelindo (2023), processed

The results show that the Gresik Terminal WTP is highly efficient (0.04 hours or ± 2.4 minutes). However, the average AT time was 3.44 hours, higher than the RKAP (Work Plan and Budget) of 2.23 hours. This means that despite excellent initial coordination, the pilotage process still requires considerable time.

Jamrud Terminal

Jamrud Terminal showed stable performance with WTP well below target and AT slightly lower than RKAP.

Table 2. Average WTP and AT of Jamrud Terminal in 2023

Indicator	Unit	Work Plan and Budget	Average	Information
WTP	Hours	0.50	0.06	Efficient
AT	Hours	5.00	4.66	Better than target

Source: PT Pelindo (2023), processed

The WTP was only 0.06 hours (± 3.6 minutes), indicating virtually no disruption. The AT of 4.66 hours was below the target of 5.00 hours, indicating relatively efficient service.

Kalimas Terminal

Kalimas Terminal had no pilotage activities in 2023 because the majority of vessels served were small and not required to pilotage. Therefore, a WTP value was not available.

Nilam Mirah Terminal

Nilam Mirah Terminal recorded excellent performance, with WTP well below target and AT lower than RKAP.

Table 3. Average WTP and AT of Nilam Mirah Terminal in 2023

Indicator	Unit	Work Plan and Budget	Average	Information
WTP	Hours	0.50	0.06	Efficient
AT	Hours	5.50	4.36	Better than target

Source: PT Pelindo (2023), processed

The results showed a WTP of 0.06 hours (± 3.6 minutes) and an AT of 4.36 hours, exceeding the RKAP target of 5.50 hours. This terminal is one of the most consistent.

Lamong Bay Terminal (TTL) Tanjung Perak

The TTL terminal has a relatively high average WTP compared to other terminals, approaching the RKAP target.

Table 4. Average WTP and AT TTL Tanjung Perak in 2023

Indicator	Unit	Work Plan and Budget	Average	Information
WTP	Hours	0.50	0.47	Almost reached the RKAP limit
AT	Hours	5.00	5.02	Relatively on target

Source: PT Pelindo (2023), processed

The average WTP was 0.47 hours (± 28 minutes), still within the tolerance limit, but it spiked sharply in August to 5 hours. The AT remained relatively stable at 5.02 hours, nearly matching the target.

Inter-Terminal Recapitulation

To see the general picture, Table 5 presents a recapitulation of WTP and AT for all terminals.

Table 5. Recapitulation of Average WTP and AT of APBS Terminals in 2023

Terminal	Unqualified for RKAP	Average WTP	AT RKAP	AT Average	Information
Gresik	0.50	0.04	2.23	3.44	Efficient WTP, high AT
Jamrud	0.50	0.06	5.00	4.66	Efficient
Patchouli Mirah	0.50	0.06	5.50	4.36	Efficient
Location and Place of Tanjung Perak	0.50	0.47	5.00	5.02	According to target, WTP is approaching the limit
Kalimas	–	–	–	–	No guide activity

Source: PT Pelindo (2023), processed

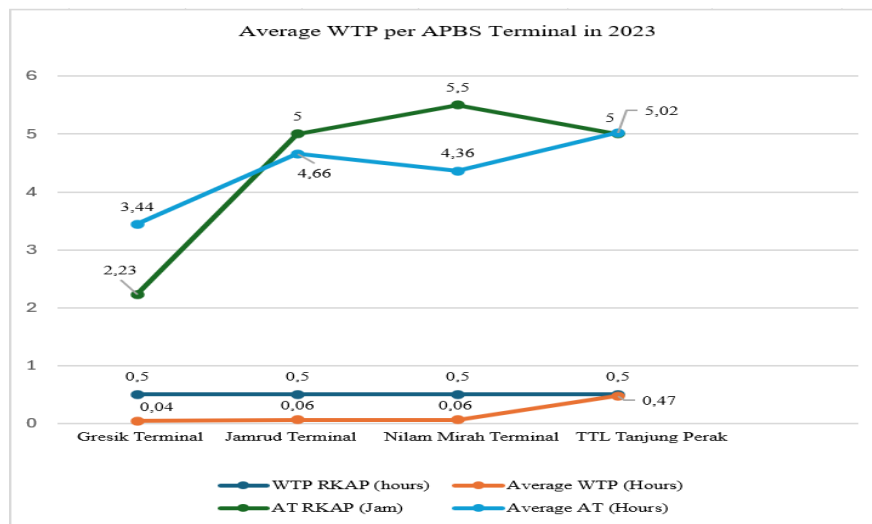


Figure 1. Comparison Chart of Average WTP and AT vs. RKAP Terminal APBS 2023 Source: Monthly Monitoring Data for Regional 3 – PT Pelindo (2023).

Operational Efficiency Discussion

The results show that:

1. WTP was highly efficient at almost all terminals, with results well below the RKAP (Regional Budget Plan). Gresik Terminal excelled with a WTP of just 0.04 hours, while Jamrud and Nilam Mirah consistently maintained WTPs at 0.06 hours. Time to Ship (TTL) remained on target, although approaching the limit (0.47 hours).
2. AT varies between terminals. Jamrud and Nilam Mirah terminals are efficient because AT is lower than target. Gresik terminal actually has AT higher than target, while TTL is relatively stable.
3. An anomaly occurred at TTL Tanjung Perak in August, when the WTP jumped to 5 hours, which was most likely caused by external factors such as bad weather or delays in pilot assignments.

Summary Findings

In general, the research results show that:

1. WTP efficiency at APBS is already very good, with the majority of terminals well below the 0.50 hour target.
2. AT still needs to be improved, especially at the Gresik Terminal which recorded a significant deviation from the target.

3. The use of VTS and E-Pilotage technology has the potential to be a strategic solution to improve AT deviation and maintain WTP consistency, especially in terminals with high traffic loads.

CONCLUSION

This study analyzes the Waiting Time for Pilot (WTP) and Approach Time (AT) trends at the main terminals of the Surabaya West Shipping Lane (APBS) throughout 2023. The results show several important findings: 1) WTP Efficiency. All terminals managed to maintain an average WTP below the RKAP target of 0.50 hours, except for Tanjung Perak's Teluk Lamong (TTL) Terminal, which recorded a value approaching the limit (0.47 hours). Gresik Terminal performed best with a WTP of only 0.04 hours, while Jamrud and Nilam Mirah consistently maintained a WTP of 0.06 hours. 2) Variation in AT between terminals. Jamrud and Nilam Mirah Terminals recorded AT lower than the RKAP target, indicating good operational efficiency. TTL Tanjung Perak Terminal was relatively on target, while Gresik Terminal showed a negative deviation with AT higher than the RKAP. 3) Operational anomalies. The extreme WTP spike at the Tanjung Perak TTL Terminal in August (5 hours) indicates external factors that need to be addressed through more adaptive operational planning. 4) Strategic implications. Pilotage service efficiency at APBS is already very good in terms of WTP (Wide-to-Air) aspects, but improvements are still needed in the AT aspect. The use of digital technologies such as Vessel Traffic Service (VTS) and E-Pilotage has the potential to be a solution to reduce AT variations, increase pilotage process speed, and maintain consistent efficiency across all terminals. Overall, this study confirms that the pilotage performance at APBS is quite efficient, but still requires optimization of operational coordination and technological innovation so that service performance is more consistent and competitive at the regional and international levels.

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